Financing Projects

- The capital structure decision
  - the choice of securities a entrepreneur uses to raise the funds it needs to invest in her project
  - lets look at this decision in a simple setting where markets are perfect and we have just equity and debt

Example

an entrepreneur invests $200 into assets today
in one year, her assets will generate either $300 or $160
this outcome depends on the economy, so project has market risk ($\beta > 0$)
assume assets have a 7% premium over the risk free rate of 5%
» required return on the assets = 12%

<table>
<thead>
<tr>
<th>Time</th>
<th>0</th>
<th>1 (bad economy)</th>
<th>1 (good economy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CF</td>
<td>-$200</td>
<td>$160</td>
<td>$300</td>
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</tbody>
</table>

- each state of the economy is equally likely so

$E[CF \text{ in 1 year}] = \frac{1}{2} \times ($300) + \frac{1}{2} \times ($160) = $230$

$NPV \text{ of investment} = -$200 + \frac{$230}{1.12} = $5.4$
Financing Choices

- The entrepreneur sells equity to raise funds
  - equity investors should be willing to pay the entrepreneur $230/1.12 = $205.4 for the equity in the project
  - as the assets are all-equity financed, it is *unlevered equity*
  - the expected return on this unlevered equity is \[
  \left[ \frac{1}{2} \left( \frac{300}{205.4} \right) + \frac{1}{2} \left( \frac{160}{205.4} \right) \right] - 1 = \frac{1}{2} (46.1\%) + \frac{1}{2} (-22.1\%) = 12\% 
  \]

- The entrepreneur decides to borrow some funds
  - she borrows $100 in addition to selling equity to raise funds
  - since assets never worth less than $160, she can borrow at the risk free rate of 5%, and she owes the debt provider $105 in 1 yr
  - the rest of the project will have to be financed with equity
  - this equity will now be *levered equity* as the project has debt
  - how much would investors be willing to pay for the remaining levered equity in this project today?

Price of Levered Equity

- Consider cash flows to securities
  - they argued that in perfect markets the Law of One Price should insure that the levered equity in this case will sell for $105.4
  - recall arbitrage in perfect market says that any positions that have the same payoffs in the future must have the same value today
  - i.e., levered financing vs unlevered financing of assets
  - in perfect financial markets leverage does not affect the value of the assets (or total value of securities financing them)
    - both debt and equity are priced to be zero NPV so their mix doesn't affect the value of assets they finance
    - the assets are only worth the PV of their E(FCF) discounted at the rate reflecting their market risk (return from CAPM using asset's beta)
      - this is just a proof of the Separation Principle from earlier
Leverage and Returns

- Leverage does affect risk and return of securities
  - the levered equity value of $105.4 is less than the PV of the expected cash flow to levered equity at a 12% discount rate
    
    \[ \text{PV CF to Equity} \times 12\% = \frac{1}{2} (\$55 + \$195)/(1.12) = \$111.6 \neq \$105.4 \]
  - in order for the levered equity to be worth $105.4 the required return on levered equity must be 18.6%
    
    \[ \frac{\$55 + 195}{105.40} - 1 = 18.6\% \]
  - the higher rate is because leverage increases the risk of equity
  - compare returns to unlevered equity, debt and levered equity

<table>
<thead>
<tr>
<th>Initial Value</th>
<th>Cash flows</th>
<th>Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
<td>0</td>
<td>1 (bad)</td>
</tr>
<tr>
<td>Unlevered Equity</td>
<td>$205.4</td>
<td>$160</td>
</tr>
<tr>
<td>Debt</td>
<td>$100</td>
<td>$105</td>
</tr>
<tr>
<td>Levered Equity</td>
<td>$105.4</td>
<td>$55</td>
</tr>
</tbody>
</table>

- leveraged equity experiences returns of -47.8% or +85% so is riskier than unlevered equity (returns of -22.1% or +46.1%)
  - thus its expected return rise from 12% to 18.6%
    - this is purely a result of leverage--there is no default risk here

Modigliani and Miller I

- In perfect capital markets
  - competitive market prices for securities
  - no taxes or transaction costs (bankruptcy is costless and no fees associated with security trading)
  - firm’s financing decisions to not change asset’s cash flows or information about asset’s cash flows
  - the total value of a firm is not affected by its choice of capital structure

- if this were not true in this environment, an investor could create his/her own leverage and arbitrage
  - an investor can perfectly adjust the leverage of her equity position by borrowing or lending debt on their own account

Example:

suppose an investor wanted levered equity and only unlevered equity was available. Rather than offer to pay a premium for levered equity to generate a supply, she can borrow funds and invest these funds plus some of her own money in unlevered equity and create levered equity
Do-It-Yourself Leverage

**Example**

Suppose an investor desired leveraged equity. The investor wants to buy 1% of levered equity, $E_L$, in a firm. This will have a higher expected return because it is levered.

- Investor’s payoff to 1% of $E_L$ is 1% of firm’s profits after interest.
  - Firm makes interest payments = $D_L \times$ interest rate
  - Payoff to 1% $E_L$ = 1% x (total profits - $D_L \times$ interest rate)

Instead, the investor could borrow 1% of $D_L$ on her own account and then buy 1% equity, $E_U$, in comparable unlevered firm.

- Investor’s payoff would be 1% of firm’s total profits (payoff on 1% $E_U$)
  - Less the interest on her borrowing (interest rate x 1% of $D_L$)
  - Investor has to pay interest = 1% of $D_L \times$ interest rate on borrowing

The payoffs on these two investments are the same:

- $1\% \times V_L = 1\% \times V_U$ - which means: 1% of $V_L = 1\% \times (D_L + E_L) = 1\% \times E_U = 1\% \times V_U$
- This implies that $V_U = V_L$
- Capital structure does not affect firm value in M&M world.

Recapitalization and Share Price

**Example**

Consider the market value balance sheet of Why Me Co. (WMC):

- MV of Assets = $75,000
- D = MV of debt = $25,000
- E = MV of equity = $50,000
- V = A = $75,000
- D + E = $75,000

WMC currently has 1000 shares of equity each trading at $50.

WMC decides to increase leverage up by issuing $10,000 of additional debt and using the proceeds to buy back shares.

- $10,000 will buy 200 shares @ $50 leaving 800 shares
- $D$ will rise by $10,000 from $25,000 to $35,000

What will $E$ and share price be after the recapitalization?

- MV of Assets = $75,000
- D = MV of debt = $35,000
- E = MV of equity = $40,000
- V = A = $75,000
- D + E = $75,000

Post recapitalization, $V = $75,000 as assets were not affected.

- $D$ is now $35,000 so $E$ has to be $40,000 with 800 shares outstanding.
- Share price remains $40,000 / 800 = $50

The firm issued $10,000 of debt and repurchased $10,000 of shares.
Weighted Average Cost of Capital

- From M&M I, the MV of the levered assets is the MV of unlevered equity which also is the sum of D + E
  - the value of the unlevered assets U is same as levered value \( V_L = E + D = U \)
  - if we multiply each component by its realized rate of return we get a cash flow identity
    \[
    (U \times R_U) = (E \times R_E) + (D \times R_D) = ((E + D) \times R_U)
    \]
    - \( R_U \) = realized return to unlevered equity (also realized return on assets)
    - \( R_E \) = realized return on equity securities
    - \( R_D \) = realized return on debt securities
  - this is because all of the cash flows to unlevered equity (cash flow from the assets) must go to either equity or debt holders
  - rearranging we see that the return to unlevered equity is just a weighted average of the return to levered equity and debt
    \[
    R_U = \frac{E}{E+D} \times R_E + \frac{D}{E+D} \times R_D
    \]
- \( R_U \) is a weighted average of realized returns on levered equity, \( R_E \), and debt, \( R_D \) where weights are proportional MV of securities

Modigliani and Miller II

- Taking this weighted average return relation
  \[
  R_U = R_E \times \left[ \frac{E}{E+D} \right] + R_D \times \left[ \frac{D}{E+D} \right]
  \]
  - by rearranging to solve for \( R_E \), we see how \( R_E \) has to be related to \( R_U \) and the leverage decision \((D/E)\)
    \[
    R_E = R_U + \frac{D}{E} \times (R_U - R_D)
    \]
    - it is easy to see that \( R_E \) is riskier than \( R_U \) as \( R_E \) is higher than \( R_U \) when the assets return is better than \( R_D \), but is worse the \( R_U \) when the assets return is less than \( R_D \)
      - the sensitivity is directly proportional to the D/E choice of the firm
- if we replace realized returns, \( R \) with expected returns, \( r \), this relation becomes the **M&M proposition II**
  \[
  r_E = r_U + \frac{D}{E} \times (r_U - r_D)
  \]
  - the cost of capital for levered equity is the cost of capital for unlevered equity plus a premium that is proportional to D/E
    - since \( r_U > r_D \), \( r_E \) will be higher than \( r_U \) whenever \( D/E > 0 \)
WACC and Return Identities

- By definition when assets are all-equity financed

\[ r_{U} = r_{A} \]

- the cost of capital for unlevered equity (unlevered cost of capital) is also the asset's cost of capital
  - when we need a cost of capital for assets for capital budgeting we can use the cost of capital for unlevered equity of similar assets
    - but the equity must be unlevered (no debt in capital structure)

- when unlevered equity of similar assets is not available how do we determine the unlevered cost of capital?
  - aka the cost of capital for the assets
  - we can use the weighted average costs of capital \( r_E \) and \( r_D \), (WACC\(_{\text{NO TAX}}\)) for similar assets

\[ \text{WACC}_{\text{NO TAX}} = \frac{E}{(E+D)} \times r_E + \frac{D}{(E+D)} \times r_D \]

- where this is the same as before, we just replace realized returns, \( r \) with expected returns, \( r \)

- thus we have the following relationship

\[ \text{WACC}_{\text{NO TAX}} = r_U = r_A \]

MM Proposition I Visually

- Graphically, \( \text{WACC}_{\text{NO TAX}} \) is independent of choice of debt, but \( r_E \) and eventually \( r_D \) increase with \( D \)

\[ r_E = r_U + \frac{D}{E} (r_U - r_D) \]

- \( r_E \) grows with \( D \) but the weight on the lower cost \( D \) increases so that the weighted average rate does not change
  - it is simply a result of assuming that all CF from the assets is distributed to \( D \) or \( E \)
De-Levering Beta

- We can also determine $r_U$ using estimates of beta
  - these beta estimates almost always come from other assets whose equity is levered
    - we generally estimate levered equity betas = $\beta_E$
    - but we want an estimate of the unlevered equity beta = $\beta_U$
      - $\beta_U$ measures the market risk without the impact of leverage
  - these are related in the following way
    
    $\beta_U = \left[ \frac{E}{(E+D)} \right] \beta_E + \left[ \frac{D}{(E+D)} \right] \beta_D$
    
    if the debt is risk free then $\beta_d = 0$ and the formula becomes
    
    $\beta_E = (1 + (D/E)) \beta_U$
    
    thus leverage leads to proportional increases in the equity beta relative to the unlevered beta
  - if debt is not risk free then $\beta_d > 0$ (typically ~0.01 – 0.30)

- plug the estimate of $\beta_U$ into the CAPM to get an estimate of $r_U$
  
  $r_U = r_f + \beta_U (E[R_M] - r_f)$

Determining $R_U$

- Use data on these 4 firms in the same industry to determine $r_U$ for assets in this industry

<table>
<thead>
<tr>
<th>Firm</th>
<th>$r_E$</th>
<th>$r_D$</th>
<th>D</th>
<th>E</th>
<th>D/E</th>
<th>$\beta_E$</th>
<th>$\beta_D$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>10.0%</td>
<td>5.0%</td>
<td>120</td>
<td>1250</td>
<td>0.1</td>
<td>0.84</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>11.4%</td>
<td>5.0%</td>
<td>245</td>
<td>665</td>
<td>0.4</td>
<td>1.07</td>
<td>0</td>
</tr>
<tr>
<td>C</td>
<td>14.2%</td>
<td>5.6%</td>
<td>1530</td>
<td>1650</td>
<td>0.9</td>
<td>1.53</td>
<td>0.1</td>
</tr>
<tr>
<td>D</td>
<td>15.1%</td>
<td>6.5%</td>
<td>750</td>
<td>475</td>
<td>1.6</td>
<td>1.69</td>
<td>0.25</td>
</tr>
</tbody>
</table>

(1) using $r_U = WACC_{NOTAX}$ we can calc

$r_U = \left[ \frac{E}{(E+D)} \right] r_E + \left[ \frac{D}{(E+D)} \right] r_D$

(2) using betas we can calculate $\beta_U$

$\beta_U = \left[ \frac{E}{(E+D)} \right] \beta_E + \left[ \frac{D}{(E+D)} \right] \beta_D$

with $r_f = 5\%$ and $(E[R_M] - r_f) = 6\%$ we get the following results for $r_U$

$r_U = 5\% + 0.80 \times 6\% = 9.80\%$
Summary So Far

- Modigliani and Miller propositions
  - the firm’s value is independent of its capital structure
    - any capital structure can be duplicated or “undone” by investors
      - assumes investors can create own leverage
  - cost of levered equity is cost of unlevered equity plus a premium proportional to D/E
    - leverage increases both risk and expected cash flow to equity
      - the higher cash flow and higher risk offset so there is no change in value of equity (per share) with leverage
        - just less equity when you use some debt to help finance assets
    - cost of capital on assets is determined by characteristics of assets and is the same as expected return to unlevered equity
      - this return is simply split amongst securities so the weighted average of cost of capital for debt and equity must equal r_U
        - r_U an be determined by WACC_{NOTAX} or unlevering equity betas
  - these propositions depend on perfect capital markets

Capital Structure with Corporate Taxes

- Capital structure in the real world with taxes
  - in reality, one of the advantages of debt is tax deductibility of the interest payments
    - interest payments are tax deductible while dividends are not
      - interest payments create a tax shield = interest payment x tax rate
      - impact of tax shield is to increase value to shareholders

Example

Consider a firm with $1,000 of debt at 8% interest, tax rate = 35%

annual interest payment = $1,000 x 8% = $80
annual interest tax shield = $80 x 35% = $28

do the tax shield means the government pays $28 of the interest payment
this tax shield is a valuable asset

tax shield affects the total after tax cash flows of the firm

equity holders get to keep the tax shield amount that otherwise would have gone to the government
Value of Debt to Firm

- **Impact of debt on cash flows of firm in given period**

<table>
<thead>
<tr>
<th></th>
<th>Unlevered Firm</th>
<th>Levered Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBIT</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>interest to bond holder (BH)</td>
<td>$0</td>
<td>$80</td>
</tr>
<tr>
<td>pre-tax income</td>
<td>$1,000</td>
<td>$920</td>
</tr>
<tr>
<td>corporate tax ($τ_C = 35%)</td>
<td>$350</td>
<td>$322</td>
</tr>
<tr>
<td>cash flow to shareholder (SH)</td>
<td>$650</td>
<td>$598</td>
</tr>
<tr>
<td>total cash flows to SH and BH</td>
<td>$650</td>
<td>$678 (= $598 + 80)</td>
</tr>
<tr>
<td>interest tax shield</td>
<td>$0</td>
<td>$28</td>
</tr>
</tbody>
</table>

- with corporate taxes, the total cash flows of the levered firm are more than that of the unlevered firm
  - increment is value of that period’s interest tax shield
- if the debt is permanent, this tax shield is a perpetuity
  - borrowing rate is appropriate discount rate for determining PV
  - PV of tax shields = $C/r = $28/.08 = $350
    - value of levered firm (D + E) is greater than unlevered firm by $350
      - PV of tax shield gain here is $τ_C x D = $1,000 x 35%

Value of the Firm with Taxes

- In contrast to M&M proposition, with taxes cash flows of firm is divided into three parts
  - equity claims, debt claims, and government tax claims
    - the pre-tax value of firm is not affected by capital structure
      - but making gov’t slice smaller increases value to debt and equity
  - M&M proposition I corrected for taxes
    Value of levered firm, $V_L = V_U + PV(ITS)$
    - $V_U$ is value of firm with all equity finance
    - PV(ITS) is the PV of the firm’s interest tax shields
    - in case of permanent debt, D, $PV(ITS) = (r_D x τ_C x D) / r_D = τ_C x D$
      $V_L = V_U + τ_C x D$
    - this result suggests that increasing D adds value to firm
      - this simple view overstates value of debt in capital structure
        - tax shields are valuable only when there is enough income to deduct them against
        - debt has other costs that we will consider shortly
WACC and Taxes

- We can also incorporate the tax benefit of leverage into the WACC
  - with corporate tax deductibility, the actual interest cost of leverage to the firm is not $r_D$ but $r_D \times (1 - \tau_C)$
  - earlier the $WACC_{NOTAX}$ we calculated as the weighted average of the return to debt and equity holders
    - this was the cost of capital for free cash flows of the assets
      - this FCF did not account for leverage
    - when discounting FCF to assets, we can account for the ITS in the WACC by using the after tax cost of debt
      $$WACC_{TAXES} = r_{WACC} = \left(\frac{E}{(E+D)}\right) r_E + \left(\frac{D}{(E+D)}\right) r_D (1 - \tau_C)$$
    - since world has taxes, this is the weighted average cost of capital that people are referring to when they use the term "WACC"
    - notice that $r_{WACC}$ is just the $WACC_{NOTAX}$ reduced by the weighted tax savings from leverage
      - $r_{WACC} = WACC_{NOTAX} - \left[\frac{D}{(E+D)}\right] r_D \tau_C$

WACC with and without Corporate Taxes
Reality Check

- Corporate taxes suggest that firms wanting to maximize value should use a significant amount of debt
  - however, many firms use limited or little debt
    - are the management of these firms stupid?
    - or have we missed something?
  - several possibilities
    - the interaction of corporate and personal taxes could provide a disincentive for corporate borrowing
      - taxation of interest income at the personal level counteracts corporate tax advantage for debt
    - interest tax shield benefit limited by EBIT
    - borrowing incurs other costs, such as bankruptcy
      - these make debt increasingly costly
  - let's consider these issues separately

Personal Taxes

- Impact of personal taxes on after-tax returns
  - interest is taxed at personal income tax rate = \( \tau_i \)
  - equity income (dividends/capital gains) is first taxed at the firm level, \( \tau_c \) and then again at the personal equity rate = \( \tau_e \)
    - effective capital gains rate may be lower as it can be deferred
      - you don't pay capital gains tax until gain is realized (sale of security)
  - comparing investor's net after tax on $1 of pre-tax corporate income, interest income has a lower total tax burden when
    \[
    $(1-\tau_i) > $(1-\tau_c)(1-\tau_e)
    \]
    - if these two amounts are equal, then capital structure is again irrelevant
  - under current US tax rules, advantage remains to debt
    - \( \tau_i = 35\% \) (top rate) \( \tau_c = 15\% \) \( \tau_e = 35\% \)
      - \( (1-.35) = 0.65 > 0.553 = (1-.35)(1 -.15) \)
  - tax advantage of debt
    \[
    \tau^* = 1 - (1-\tau_c)(1-\tau_e)/(1-\tau_i) = .15
    \]
    - in theory we should use this rate when determining the savings of using debt, \( V_L = V_U + D \times \tau^* \), though practice often just uses \( \tau_c \)
The Use of Debt

- We saw that firms issue more debt than equity
  - debt is preferred external financing security though most firms depend largely on internal financing
    - in US debt was only 36% of capital structure in 2005
      - wide variation across industries
  - but debt offers a valuable tax shield and can lower the WACC!
    - why does debt make up less than 50% of capital structure and why does it vary so much across firms / industries?

Full Tax Benefit of Debt

- To get full tax benefit of debt, a firm doesn’t need all debt financing, only as much as it can pay for
  - tax benefits accrue only when interest expense < EBIT
    - when interest expense > EBIT, value no longer increases with D
  - the optimal level of debt for a firm with certain EBIT is given by
    - interest expense = rD x Debt ≤ EBIT => D* ≤ EBIT / rD
      - we are ignoring tax loss carry backs and forwards in this derivation
    - for debt above this level, investors pay a tax penalty for debt as personal tax on interest > tax savings on equity losses
      - with uncertainty in EBIT, optimal interest expense is even lower

- Expected tax savings for rD = 7.6%:
  - D* = $13,200 with certainty
  - D* = $12,000 with uncertainty
Costs of Financial Distress

- The use of too much debt can lead in some cases to financial distress and bankruptcy
  - **bankruptcy**
    - this is a legal state in which creditors are allowed to exercise control over the assets of the firm
    - triggered by the default on some promised payment to creditors
    - US has Chapter 7 – liquidation and Chapter 11 – reorganization
  - **financial distress**
    - this is the state when the firm is near bankruptcy but not in it, but the firm’s operations are affected by its fragile financial situation
    - the firm’s ability to generate cash flow is reduced because it is “near bankruptcy”
  - **financial distress and bankruptcy are costly to SHs**
    - investors worry about expected costs of financial distress, E(CFD)
      - these are real costs that shareholders ultimately pay and thus they take into account when determining expected future cash flows

Expected Costs of Financial Distress

- **E(CFD) is a combination of**
  - the probability of experiencing financial distress or bankruptcy
    - likelihood that the assets will perform poorly enough that a state of distress or bankruptcy occurs
  - the magnitude of costs the firm pays in these situations
    - the costs, in terms of FCF, the project suffers when in financial distress / bankruptcy
  - both of these components of E(CFD) are asset specific
    - the probability of experiencing a distress/bankruptcy state is a function of two things:
      1. income volatility
      2. proportion of debt financing
        - the more volatile the asset’s income flows, the greater the risk of a default state occurring for a given level of debt
        - the larger the proportion of debt financing, the greater the risk of a default state occurring for a given level of income volatility
    - let’s consider the actual costs of a bankruptcy or distress state
Bankruptcy Costs

- Bankruptcy costs are not the decline in asset value that ultimately triggers bankruptcy
  - they are costs the firm incurs when bankruptcy happens
    - examples are legal and court fees
    - this further reduces the value of assets once in bankruptcy
    - reduces payoff to both debt and equity holders
  - by issuing risky debt, the firm has given other parties (lawyers) a potential claim on some of the assets of the firm
  - the market value of the firm to the debt and equity holders is reduced by the expected value of this claim
  - the cost is borne by shareholders as creditors foresee these potential costs and demand compensation in terms of higher payoff when the firm does not default

Financial Distress Costs

- Direct bankruptcy costs are most noticeable
  - though studies suggest that these are only ~ 3 – 5% assets
  - perhaps more significant are the indirect costs of distress
    - these are costs that the firm incurs when it gets near bankruptcy
      - hard to measure precisely, but these may be much larger than the direct costs of financial distress
- examples:
  - customers unwilling to do business with risky firm
    - especially important for firms that include service with sale of good
    - customers become wary of businesses with credence goods: goods whose value can only be determined ex-post
  - suppliers demand cash in advance rather than offer credit
  - best employees jump ship or demand higher compensation
- together these issues results in lower FCF when in distress as well as increased probability of bankruptcy
Costs of Distress Across Industries

- Financial distress costs will vary a lot across industry
  - compare hotel firm to software firm
    - for hotel firm cost of bankruptcy is rather low
      - the hotel firm’s assets’ ability to generate future cash flow is not significantly affected by distress/bankruptcy
        - costs limited—mostly to legal and administrative costs
        - little cash flow generating ability of assets lost in ownership transfer
    - cost of bankruptcy much higher to software firm
      - software firm’s assets’ ability to generate future cash flow significantly affected by distress/bankruptcy
        - customers shy away over doubt of future tech support
        - assets less tangible, so little value if “sold for cash” so less recovery
        - asset operation is more skill-dependent so cash flow generating ability depends on owner
    - expected bankruptcy costs much higher for software firm
      - not due to probability of distress but because of higher costs if distress occurs

Impact of E(CFD) on Firm Value

- The impact of expected distress costs is to reduce the value of the firm
  \[ V_L = V_U + PV(ITS) - PV(E[Costs Fin Distress]) \]
  - unlike the ITS, the E(CFD) will vary depending on the features of the firm
  - since the probability of these costs are increasing in the proportion of debt uses, they will act as an offset to the tax advantage of debt
Agency Costs and Leverage

- Both BH and SH want distressed firms to recover
  - but their interests may conflict
    - these conflicts get in the way of proper decisions
    - the problems associated with this conflict of interests are referred to as agency costs
  - consider firm with market value asset < face value of debt
    - liquidation value of equity is zero, but market value is small
  - SH will have incentives to act to transfer wealth from BH to SH
    - switch to or invest any FCF in new riskier assets (overinvestment problem)
      - they prefer to go for broke since they have limited liability
    - not provide new equity for NPV>0 projects (underinvestment problem)
      - most of the value of the project goes to debtholders
    - have incentive to cash in and run
      - dividend payments a transfer of wealth from BH to SH
    - likely to try bait and switch
      - offer risky debt on top of earlier “safe” debt to harm of existing BH
    - if all else fails, SH have incentive to “play for time”
      - SH want to delay liquidation to allow more good luck

Agency Costs

- These problems always exist between SH and DH but are most severe when firm is in distress
  - debtholders are aware that these problems can occur
    - they are aware of the SH incentives to misbehave when firms approach financial distress
    - they factor these potential risks into the return they require for lending money
      - the borrowing rates reflect the potential agency costs
        - this means that shareholders are paying for these “costs”
  - thus, agency costs are borne by the SH
    - SH have incentives to promise to behave better
    - we see lots of restrictions in debt - called covenants
      - examples: no new debt issues unless interest coverage > 2
        - lender can call for repayment if D/E exceeds 3
        - SH agree to present frequent audited reports
        - creditors must be consulted on large investment
      - thus, SH voluntarily tie their hands to reduce agency costs
Agency Benefits of Leverage

- Leverage can also work to provide positive value by creating incentives to owners
  - leverage allows for a concentration of ownership (SH)
    - less equity needed as more debt is used
    - major SH have a stronger interest in success of firm
  - leverage forces managers to keep an eye on the bottom line to prevent default
    - in this sense leverage is a commitment mechanism to force managers to pursue strategies with greater vigor
      » Cortez burning his ships to make his men fight harder
  - leverage eliminates excess free cash flow and reduces wasteful investment
    - use of substantial debt leaves less internal cash flow and reduces the possibility of wasteful investment
      » avoids the stupid investment decisions resulting from “money burning a whole in your pocket”

Trade-off Theory of Capital Structure

- A theory that managers trade-off interest tax shields, costs of financial distress, and agency costs when choosing D/E ratio to maximize firm value, $V_L$
  $V_L = V_U + PV(ITS) – PV(E[Costs Fin Distress]) – PV(Agency costs of debt) + PV(Agency benefits of debt)$
  - firms with more predictable income, tangible assets, and low agency costs relative benefits will be predicted to use more debt
  - volatile income firms with intangible assets, and high agency costs relative to benefits will use less debt
- there are costs associated with changing D/E ratio
  - costs of adjusting debt ratio mean firms are not necessarily at optimums but slowly moving towards them
    » thus, we would not expect to see all similar firms with the same D/E ratios
- the theory works well but, it doesn’t explain everyone
  - some firms have little or no debt
Additional Theories of Capital Structure

- Generally firms carry less debt than predicted by the trade-off theory
  - optimality in this model would suggest that firms should carry more debt than they typically do

- Some possible explanations
  - other factors not considered
    - management entrenchment
      - managers have personal incentives to use less debt to avoid the discipline of debt and maintain their job security
    - issues associated with asymmetric information
      - managers have incentives to be somewhat biased about prospects for the firm
      - leverage is interpreted by outsiders as a credible signal about the future prospects of the firm or the new project
        - a change in leverage is a more credible than manager’s verbal statements because it would be costly too do if the claims were not true

Pecking Order Theory

- Asymmetric information between managers and investors create incentives for capital raising
  - managers know more about prospects and real condition of firm than outsiders
    - investors recognize this and infer information from the decisions managers make regarding their financing choices
  - managers have incentives to issue new equity when they think the firm is over-valued or for new projects that are riskier than they appear
    - equity issues convey information that reduces firm value
  - managers have incentives to issue debt when they think the firm is undervalued or for “good” projects because they don’t have to share all the gains
    - debt issues convey information that is generally positive about the firm
  - this is consistent with evidence that debt offers are more frequent than equity offers
Pecking Order Hypothesis

- Information asymmetry and transaction costs lead to a pecking order for financing choices
  1. firms prefer internal financing - no info or transaction costs
     - this is really equity financing as it decreases retained earnings
     - firms target their retention rate to their investment opportunities
  2. surplus cash is used to pay down debt or invest in marketable securities and firms draw down cash balances or marketable securities first when extra cash is needed
     - surplus cash is that above dividends and investment opportunities
  3. if external financing is needed the firm’s first choice is debt, then possibly hybrid securities, and then finally equity

- this theory helps explain deviations from trade-off theory
  - firms find financial slack valuable
    - this is the ability to be able to borrow suddenly if needed
      - allows them to respond quickly to new investment opportunities
      - if always at optimal D/E, then external financing would have to be part D and part E

Summary

- Capital structure theories
  - perfect markets and M&M proposition I and II
    - capital structure does not matter to value of assets
    - required return on leveraged equity is return on unlevered equity plus premium proportional to D/E
  - impact of taxes
    - debt produces interest tax shields and adds to value of firm
    - if only influence would suggest value maximization is to use primarily debt financing
  - impact of other market imperfections
    - debt is valuable with income deduct interest against and debt adds financial distress costs that offset advantage of tax shields
- agency costs of debt
  - nature of conflicts between shareholders and debtholders
- trade-off theory and pecking order theory
  - together, how do they help explain what we see